## A.D. 1824 . . . . . . . Nº 5006.

# SPECIFICATION

OF

## PIERRE ALEGRE.

## FURNACES AND BOILERS OF STEAM ENGINES.

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# Furnaces and Boilers of Steam Engines.

## ALEGRE'S SPECIFICATION.

**TO ALL TO WHOM THESE PRESENTS SHALL COME**, I, Pierre Alegre, of Zerez de la Frontera, in the Kingdom of Spain, Engineer, now residing at Colet Place, Commercial Road, in the County of Middlesex, send greeting.

**WHEREAS** His most Excellent Majesty King George the Fourth, by His Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Seventh day of October, in the fifth year of His reign, did, for Himself, and His heirs and successors, give and grant unto me, the said Pierre Alegre, my exõrs, adm̃ors, and assigns, or such others as I, the said Pierre Alegre, my exõrs, adm̃ors, and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, and all His Majesty's Colonies and Plantations abroad, his Invention of "An Improved and more Economical Method of Generating Steam, applicable to Steam Engines and other Useful Purposes;" in which said Letters Patent there is contained a proviso obliging me, the said Pierre Alegre, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, in writing under my hand and seal, and to cause the same to be inrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said recited Letters Patent, as in and by the same, reference being thereto had, will more fully and at large appear.

**NOW KNOW YE**, that in compliance with the said proviso, I, the said Pierre Alegre, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, is described and ascertained as follows, reference being had to the Drawing hereunto annexed (that is to say):—

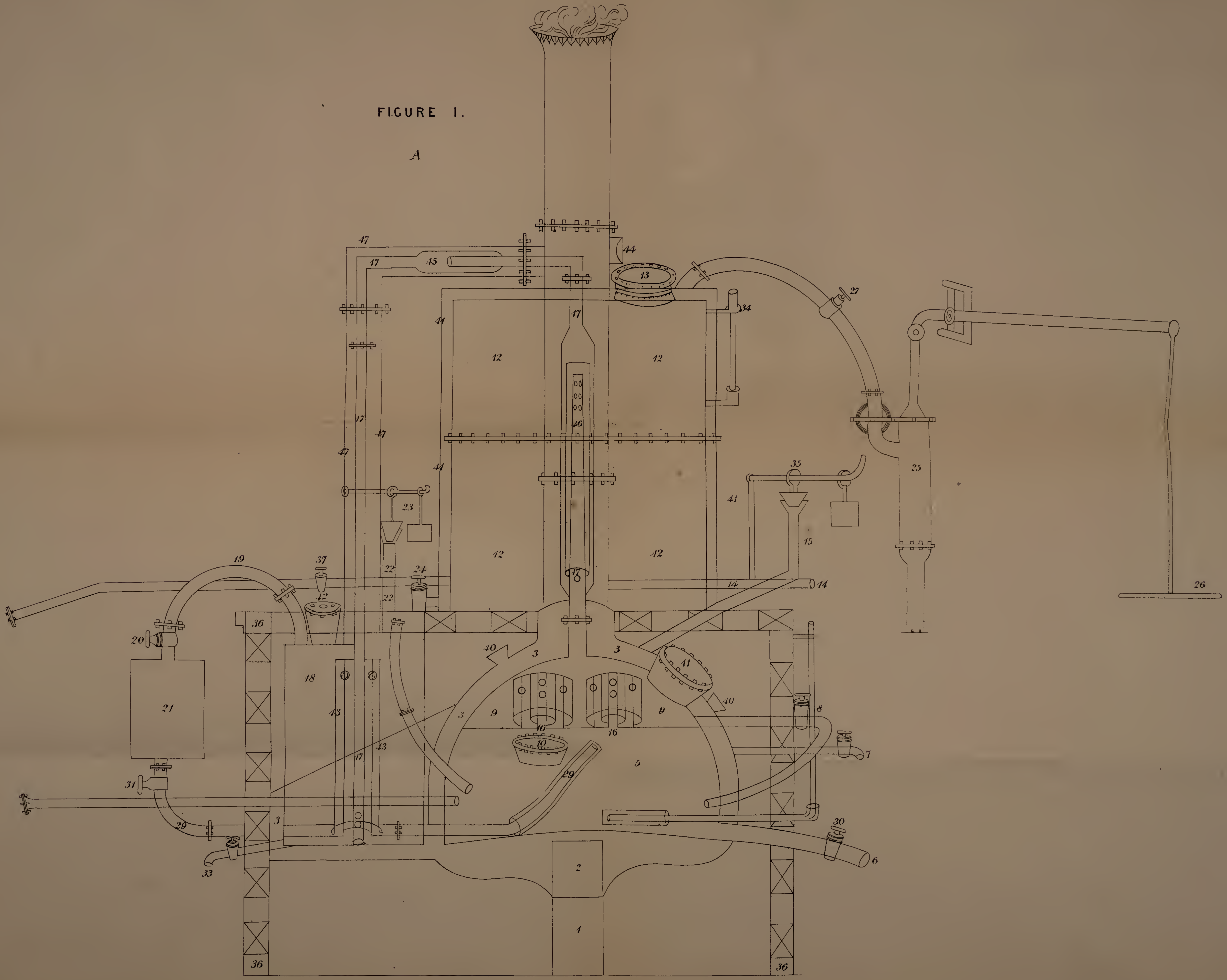
My principal pieces are, first, a boiler having a double bottom, one of them within it dividing it into two parts, but appearing externally as one boiler; 2$^{\text{dly}}$, on the upper part is placed a cylinder in the form of a column, within which rises the funnel; and, thirdly, a cylinder is fixed parallel with the side of the said boiler and resting on part of the ascending flame from the furnace. All these pieces are connected with each other by means of various pipes that convey the steam into a cylindrical vessel, or in a cylinder or vessel immediately communicating with it, in which I suppose to be placed the first spring of the engine to be set in motion. The annexed Drawing, Figure I., is a plan of an apparatus; the description of one part A will answer both for that and the part B, as they are identically the same in all their component parts. In explaining the several pieces of A, the references will be marked with numbers, and for describing the pieces of B, reference will be made by letters. Description of apparatus:—A, N° 1, the ash pit; N° 2, the furnace; N° 3, the flue, where the flame circulates round the boiler in proceeding towards the funnel; N° 4, the funnel, fixed within a cylinder that rests on the upper part of the furnace in the form of a column, by which name it will be called; N° 44, an aperture in the funnel to clean it; N° 5, the principal or under boiler, so to be called; N° 6, the emptying cock; N° 7, a cock to ascertain when the boiler is too full; N° 8, the cock of a pipe communicating from the upper to the under boiler. These two boilers are separated by a division placed within, and appear as one boiler. N° 9, the upper boiler; N° 10, an aperture capable of admitting a person to enter into the under boiler for the purpose of cleaning or repairing it; N° 11, another aperture into the upper boiler, and for the same purpose; N° 40, 40, two apertures to clean the flue of the furnace; N° 12, the column, within which is the funnel, and the spaces between them serving as a reservoir, wherein the water is heated almost to boiling, at the same time as the under boiler operates, and is intended to supply the latter, as will be shewn hereafter; N$^{\text{os}}$ 41, 41, a case of wood which surrounds the column to prevent its being cooled by the air; N° 13, an aperture for cleaning the column; N° 14, a pipe proceeding from the interior of the funnel, where a gutter or channel is fixed around to receive the condensed liquid proceeding from the smoke of the furnace, that liquid being thus let out and prevented from descending into the furnace and lessening its force; N° 15, a pipe or tube, with a valve N° 35 at its extremity, and procceding from the surface of the upper boiler to give it vent in case the steam become too powerful; N° 16, 16, two pipes placed on the bottom of the upper boiler, each covered over by three more, each at inch distance from the next interior pipe all round, to facilitate the circulation of the steam arising out of the under boiler; N° 17, a pipe in which is placed a second pipe N° 46, inclosed within another, which forces the vapour to concentrate a second time. This pipe, N° 17, is better to be quadrangular, on account of its position, and its descending part is covered with a wooden pipe, N° 47, to shelter it from the air, and conveys the steam to the inferior part of the cylindrical vessel N° 18, whence the steam enters the semicircular pipe N° 19 that conveys the steam through a cock N° 20 into the vessel N° 21, which I suppose to be the point where the machine receives the first impulse; N° 22, a pipe vertically placed at the top of the vessel N° 18, to give it vent by means of a valve N° 23 at its extremity, in case of the steam being too powerful; N° 42, an aperture at the top of the vessel N° 18, for the purpose of cleaning the same; N° 45, a valve opening upwards; N° 24, the filling cock, to convey by a pipe the hot water from the column N° 12 to the under boiler N° 5, when it is worked as a single apparatus; N° 37, the filling cock, to convey by a pipe hot water from the column of apparatus A into the boiler of apparatus B, when that apparatus is required to work; N° 25, a pump to furnish water to the columns; N° 27, a cock to regulate the conveyance of the water from the pump to the column N° 12; N° 28, another cock, to regulate the conveyance water from the pump to the column R, which appertains to the apparatus B; S, a filling cock, to regulate the conveyance of the water from the column R into the boiler N° 5 of the apparatus A, which will be known to be full by the cock N° 7, which is then open, and marks the level of the water when the boiler T of the apparatus B is nearly exhausted of water. This will be known by a glass tube V connected with the pipe Z, placed at two inches distance on the bottom of the boiler T, which pipe is within another acting in an inverted direction, so that the liquid in the glass tube V may not be troubled with the ebullition, and thus it will be known for a certainty when no more than two inches of water remain in the boiler, which, if left to be completely dried, through neglect, would cause the metal to be burnt. N° 31 is a cock at the lower extremity of the vessel N° 21. N° 32 is another cock at the lower part of the same vessel N° 21, where I suppose the machine receives the first impulse. These cocks are to regulate at discretion the conveyance into either of the boilers of the surplus of the steam and that part of it which shall have been condensed after having made its efforts against the engine, without the assistance of any pump. These two pipes are each indicated in the respective apparatus by N° 29, 29, at their extremity. These pipes are covered by another pipe to prevent the return of the steam. I do not, however, consider the pipes N° 29, 29, essential to the apparatus, and I therefore claim to use the apparatus either with or without them. N° 33 is another cock at the lower part of the vessel N° 18, to let out when necessary the condensed water when the steam slackens, which happens when the boiler N° 5 ceases to work and the fire is extinguished. Here I suppose it was the apparatus A that worked; but now, while it cools, by ceasing to operate, the steam within is condensed and falls liquid into the upper boiler. It empties into the lower boiler by opening the cock 8, for if allowed to remain, it would annoy a future operation. For this reason when cleaning the boiler N° 5 from the chrystallized salts produced by the action of the fire when sea water is used, and adhering all round the boiler like a crush, which would occasion the metal to burn if not properly scraped off after every operation, the upper boiler must be cleansed also, and at the same time the water condensed in the vessel N° 18 is let out by the cock N° 33. By the above method almost every part of the apparatus A is cleansed, whilst the apparatus B is set to work, the fire under the boiler N° 5, being previously extinguished. To render this operation more intelligible I shall describe the course of an operation, and also the progress of the steam on quitting the boiler N° 5, and passing the different points of concentration to reach the vessel N° 21. Suppose the apparatus A is to work; it is then and for the first and only time that the boiler N° 5 is filled with cold water. The engine or machine of course cannot act till the water is boiling, and the steam reaches the vessel N° 21. In this first preparation for ebullition, a quantity of fuel will be necessary; but it will be economised in future operations, since the water to replace that in the boiler on its gradual consumption is contained in the columns, and during the time the boiler works that water acquires a degree of heat almost to boiling, by the time the water in the boiler ought to be renewed, as will be shewn below. The better to understand the course of the operation as it relates to the preparatory heating of the water in the column, I suppose the apparatus B has finished working, that the water in column R is heated as it ought almost to boiling, and that the apparatus A is to work. The cock S is then opened, and the hot water from the column R passes into the boiler N° 5, which will be known to be full by the water coming out of the cock N° 7, that should then be shut; at the same time the column N° 12 is to be filled by opening the cock N° 27, the water passes from the pump into the column N° 12, and when full it will be known by the glass tube N° 34, which will shew the level of the water within the column. Thus the process of filling the boiler N° 5, and the column N° 12, is concluded; but as the boiler has had the advantage of water almost boiling, and the fire will be immediately lighted in the furnace N° 2, that water will be almost instantaneously in a state of ebullition of 80° of Reaumur's. When the steam frees itself from the ebullition, it rises into the two tubes N° 16, 16, placed vertically on the bottom of the upper boiler; each of these tubes being enclosed within three more that have communication one with another at both extremities, at the upper part of which the interior pipes are pierced with little holes, and each pipe being at an inch distance all the way round, makes the steam circulate by ascent and descent, as often as there are tubes in the same vertical direction, where the effect of the heat is very considerable. The steam in its progress of ascending and descending to and from the upper boiler becomes concentrated, and by that means concentrates the heat to a very considerable degree, by virtue of the friction it must undergo, and of the heat which rises from the under boiler within the three tubes into the upper boiler, which does not contain any liquid that might diminish the heat of the steam; and as the bottom of the upper boiler acquires also a certain degree of heat from the under boiler, that heat is always increasing, which forces the steam of the upper boiler with great violence without the power of retrograding, but acquiring additional force, that compels it to pass into the pipe N° 17, which rises vertically, and wherein is the second point of concentration N° 46; that pipe conveys it to the lower part of the vessel N° 18, which is the third point of concentration, by virtue of its being covered over by two other pipes N° 43; because that vessel being of iron, receives also a certain degree of heat from the furnace, and the steam acquires still more strength, that forces it out of the vessel with extraordinary violence, and it passes into the semicircular pipe N° 19, which introduces it into the vessel N° 21, where I suppose the steam to act on the moving power; and as this steam cannot retrograde, the vessel N° 18 serving as a barrier, it then becomes more concentrated, and its force being thereby encreased, its efforts are impelled against the moving power. There the steam acts with the greatest force, having acquired all the force of which it is susceptible from the progressive increase of the heat. When the water in the boiler N° 5 begins to decrease, the other boiler in the apparatus B is to be immediately filled by conveying the hot water from the column N° 12, which passes into the boiler T, and by opening the cock N° 24, the operation will then be continued in the same manner as has been described for the progress of the steam in the preceding operation. By opening the cock W, being similar to the cock 20 in the apparatus A, and shutting immediately the cock N° 20, then the apparatus A ceases to work, and the apparatus B begins; and thus successively every time the boiler at work is reduced to nearly two inches water. The boiler is always filled with water previously heated in the column by the heat from the flue of the furnace; thus of course the water introduced in either boiler is always kept in a high state of temperature. This advantage, joined to another still more considerable, which is that proceeding from the concentration of the steam, will produce a very considerable saving in the fuel when compared to other steam apparatus, where that concentration is not effected. By the combination also of this steam apparatus, by which the steam is concentrated to a very high degree, I have constantly avoided any contact with the external air. By virtue of this precaution there is every security against explosion, which is too often caused by the pressure of the air compressed within the vessel in which the steam is formed, and of this we have but too many examples. The Drawing, Fig. I. & 2 :—A, B, is a plan of a double apparatus, when one moving power only is wanted. If instead of the single cylinder 21 for both A and B, a separate cylinder be used for each of the two, moving powers will be obtained so as to work two steam engines, or for such other purposes as may be necessary. The Drawing, Fig. II., is a plan of a single apparatus, the manner of the performance of which will be sufficiently apparent from the description of the double apparatus. The whole apparatus may be attached to one or more steam engines, as before described, the moving power either acting in the cylinder N° 21, or by communication with another cylinder or other vessel where the first motion is given to the engine by means of a pipe and valves in the usual manner, in which case the pump may be worked by the machinery to fill the columns with water. The position of the cylinder 21 may be varied according to circumstances; and though I consider the number of pipes in the upper boiler which I have mentioned is the best, the effect may in some degree be obtained by a greater or lesser number. The size of the whole apparatus will be varied according to the power of steam wanted.

In witness whereof, I, the said Pierre Alegre, have hereunto set my hand and seal, this Sixth day of December, in the year of our Lord One thousand eight hundred and twenty-four.

PIERRE (L.S.) ALEGRE.

FIGURE 1.

A



*The enrolled drawing is not colored*

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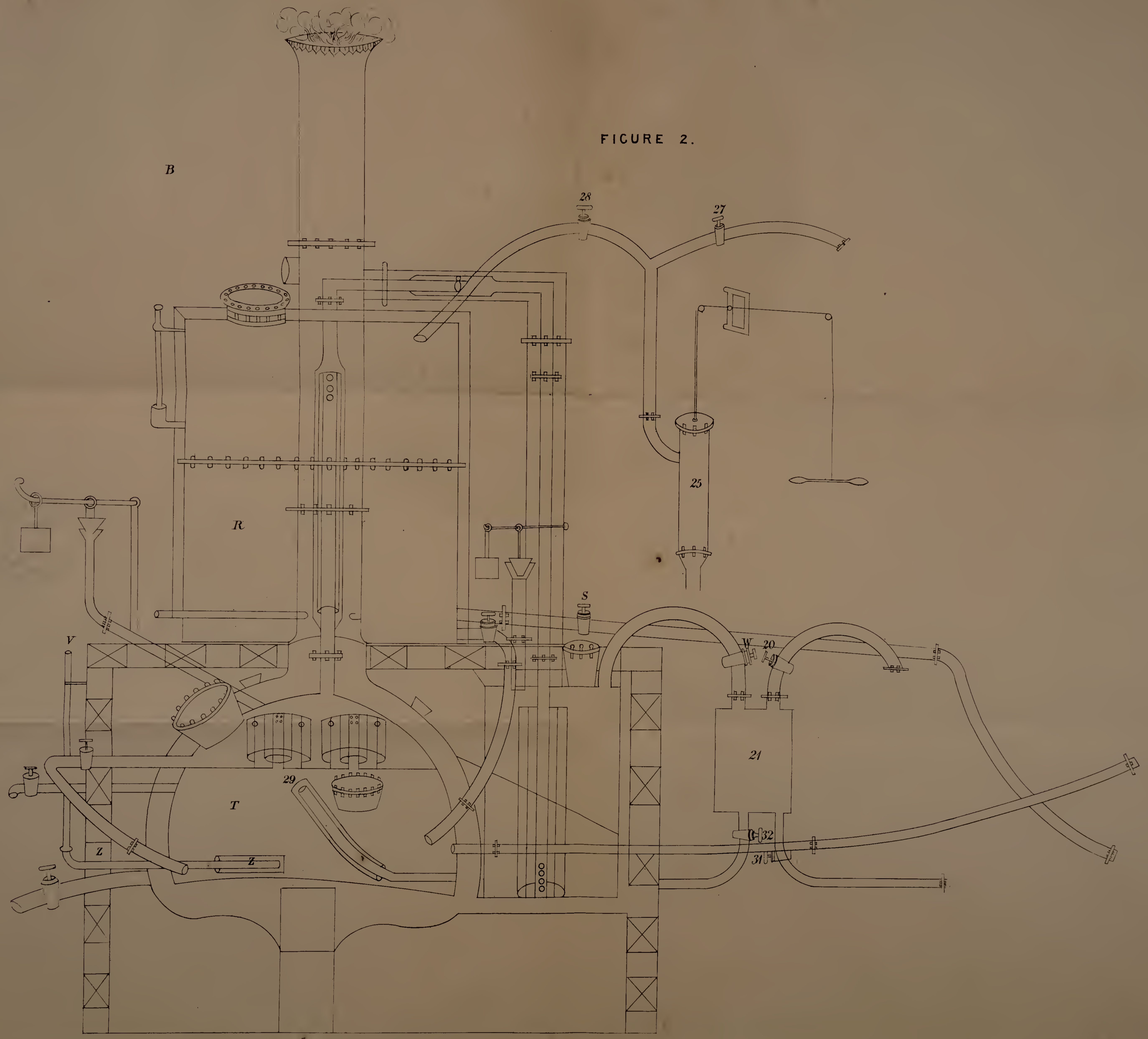
ALEGRE'S Specification.

SHEET 2.
(2 SHEETS)

FIGURE 2.



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**AND BE IT REMEMBERED**, that on the Sixth day of December, in the year of our Lord 1824, the aforesaid Pierre Alegre, through the interpretation of Luis Julen, the said interpreter being first sworn that he had duly interpreted the above Specification to the said Pierre Alegre, and he will truly interpret the acknowledgment about to be administered unto him, the said Pierre Alegre came before our said Lord the King in his Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained and specified in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

STEPHEN.

Inrolled the Seventh day of December, in the year of our Lord One thousand eight hundred and twenty-four.

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